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Southern Indian Ocean Fisheries Agreement
Accord relatif aux Pêches dans le Sud de l'Océan Indien

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MOP-12-14

SIOFA Fisheries Summary: oilfish (*Ruvettus pretiosus*) and escolar (*Lepidocybium flavobrunneum*) 2025

The SIOFA Secretariat

Meeting	Compliance Committee ☐ Meeting of the Parties ✔
Document type	Working paper ✔ Information paper ☐
Distribution	Public ✔ Restricted [1] ☐ Closed session document [2] ☐

Abstract

This paper presents the SIOFA Fisheries Summary: oilfish (*Ruvettus pretiosus*) and escolar (*Lepidocybium flavobrunneum)* 2025.
A template of the Fishery Summary type of document was first presented to and approved by SERAWG4 and SC7 in 2022, and it was adapted to this species as requested by SC7. The creation of this summary was recommended by the SC7, and a first draft was considered at SC8 but was not deemed yet ready for publication. This Summary was first endorsed by SC9 and MoP11 and published in 2024.
The 2025 version of the SIOFA Fisheries Summary: oilfish and escolar includes updated figures using data up to 2023.

[1] Restricted documents may contain confidential information. Please do not distribute restricted documents in any form without the explicit permission of the SIOFA Secretariat and the data owner(s)/provider(s).
[2] Documents available only to members invited to closed sessions.

Recommendations

The SIOFA Scientific Committee recommended that the MoP:

- **endorse** the SIOFA fisheries summary for oilfish (*Ruvettus pretiosus*) and escolar (*Lepidocybium flavobrunneum*) 2025 and **task** the Secretariat to make a public version of it, with confidential information removed, available on the SIOFA website.

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SIOFA Fisheries Summary: oilfish (*Ruvettus pretiosus*) and escolar (*Lepidocybium flavobrunneum)* 2025

Version 1.0 Date 31.01.2025 | Revised by the SIOFA SC | Endorsed by SC10

Next review date: 2027

Prepared by the SIOFA Secretariat

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Contents

Summary of updates in this version:

- Catch and Effort data is presented for the last 10 years in the series (2014–2023) and Observer data for the last 20 years (2004-20023), previous data will remain available in older reports but is not showcased here.
- Figures updated to be color-blind friendly, wherever possible, mostly using the Okabe-Ito color scale (Okabe & Ito 2008, "Color Universal Design (CUD): How to Make Figures and Presentations That Are Friendly to Colorblind People." http://jfly.iam.u-tokyo.ac.jp/color/) or other high-contrast color scales.
- Flextables used to create auto-updating nested tables.
- Observer data on biological measurements (see Section 7.1) split into the two different species, as requested by SC9.
- Data on seabirds and shark captures voluntarily submitted by Chinese Taipei, added to Sections 11.1.1 and 10.1, respectively
- Added an analysis of discards in the fishery (see Section 10.3)

1. Purpose of this document

The SIOFA Fisheries Summaries describe specific SIOFA fisheries in the SIOFA Area (Figure 1) and summarize the available information for each species, and their biology and ecology. This document is targeted at the general public and institutions and countries wanting to better understand SIOFA fisheries. It also describes SIOFA data available on SIOFA individual fisheries that could be used by scientists and consultants for scientific research.

The SIOFA Ecosystem Summary provides more detailed information on effects of SIOFA fisheries on ecosystems and species in the SIOFA Area. The SIOFA Fisheries Overview integrates these documents and describes general trends for the main fisheries in the SIOFA Area.

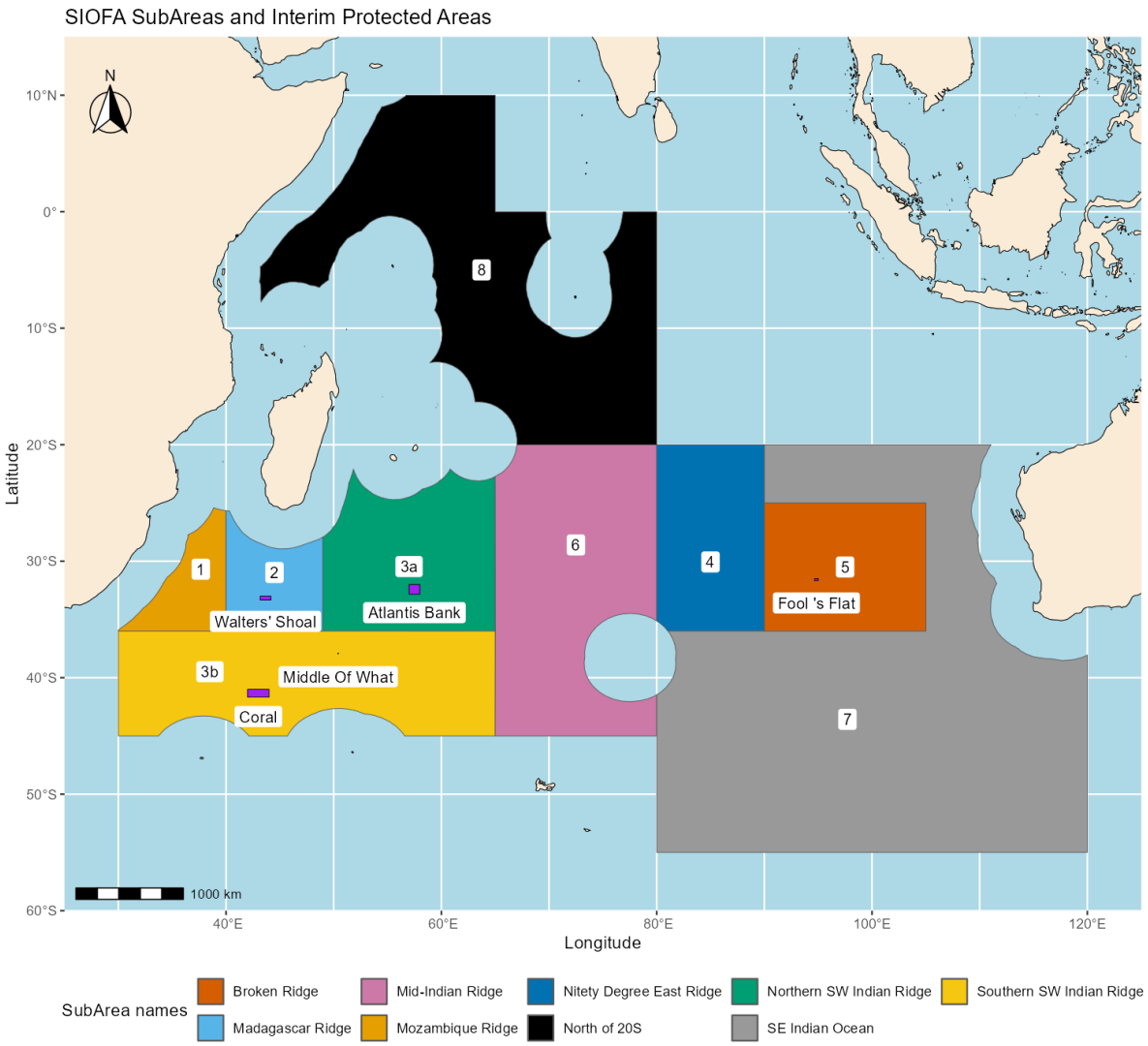


Figure 1 – The SIOFA Area and Subareas (source: SIOFA Spatial database). The Subarea numbers and colour codes are used consistently throughout this summary to identify Subareas. The map highlights SIOFA Interim Protection Areas (in magenta) as defined in CMM 01(2024) (Annex 3). All the interim protection areas have been labelled by name for easier recognition.

2. Data sources and analysis code

2.1 Data availability

There are thirteen CCPs that are members of SIOFA. The SIOFA Secretariat receives data from CCPs pertaining to their fishing activities, biological sampling, and Scientific Observer reports as per CMM 02(2023) (Data Standards). The SIOFA Secretariat acts as custodian for these data on behalf of its members. Request to release or publish these data (e.g., for scientific purposes) are regulated under CMM 03(2016) (Data Confidentiality). Data requests can be made through the SIOFA Secretariat (secretariat@siofa.org).

The main SIOFA databases are:

- AggregatedCatchEffort, which contains catch (and sometimes effort) aggregated at different spatial resolutions, varying from the whole SIOFA Area to 20' squares, from 2000 to 2019.
- HBHCatchEffort, which contains haul-by-haul catch and effort at a spatial accuracy varying from degrees to seconds, from 1998 to 2022.
- Observer, which contains Scientific Observer collected biological sampling, observer reported catches, and observed operations data, from 2012 to 2022.

The SIOFA databases are supported by other data assets such as:

- Spatial layers, which contains all the GIS spatial layers available to the Secretariat (e.g., boundaries of SIOFA Subareas, Assessment Areas). These have been collected at https://github.com/SIOFASecretariat/SIOFA_SC_Spatial_layers
- Codes, including gear and species codes etc. Some of these have been collected at https://github.com/SIOFASecretariat/FAO-unfied-codes

The main SIOFA databases have been described in the outputs of project SEC2021-05 (see SC-07-08, restricted access), where it was noted that the data was repeated (i.e., overlaps) across the first two databases. A suggestion has been made to further develop the three databases as three 'subject areas' that form part of a single SIOFA Fisheries Database in the future.

Further data (e.g., on active vessels) is available from Annual National Reports (2015–2025) that SIOFA CCPs submit to the Scientific Committee every year, which are made publicly available on the SIOFA website (https://siofa.org/meetings/groups/Scientific%20Committee%20Meeting).

2.2 Missing/incomplete/problematic data for the purposes of this report

2024 Catch, Effort and Scientific Observer data are scheduled to be submitted to the Secretariat at the end of May in 2025. Any data more recent than 2023 should be thus considered as draft, potentially incomplete and subject to further revisions, and has therefore been excluded from this report.

Inconsistencies between tows times and positions have been detected in the 2021 and 2022 data from the orange roughy fishery. Similarly, catch weights in the 2023 data from the orange roughy fishery likely contained some errors. Furthermore, small inconsistencies have been identified in the reported trap effort from 2021.

These data were included in this report, but caution should be exercised when interpreting positional data at a fine scale or catches for the most recent year.

While these reports are based on best available data, there might be other data issues that have not been detected and caution is advised when interpreting the results presented.

2.3 Data used in this report

A SIOFA database extract was delivered on 17 September 2024 and used in this report.

The information presented in this report was extracted from different sources, depending on the type of data required. To minimize the confusion that can arise from having to interpret multiple data sources, explicit references to data sources have been made in each table/figure caption in the report.

The report is intended to cover the last five years of available data (at a minimum) but note that the data used covers the 2014–2023 period (10 years of data), and that the period covered varies across the different sections as detailed below.

i. Active fleet composition (2014–2023): SIOFA HBHCatchEffort and SIOFA AggregatedCatchEffort databases
ii. Main fisheries (2000–2023): Annex 1 of CMM 17(2024).
iii. Total catches per CCP (2014–2023): SIOFA AggregatedCatchEffort database, combined with SIOFA HBHCatchEffort database.
iv. Catch, Effort (including per Subarea) and discards (2014–2023): SIOFA HBHCatchEffort database, SIOFA AggregatedCatchEffort database and spatial layers (this does not include non-fish catch, see Section 10 for definitions of target catch).
v. VMEs (2004–2023): SIOFA Observer and HBHCatchEffort databases.
vi. Fishing in Interim Protected Areas (2014–2023): SIOFA HBHCatchEffort and Spatial databases
vii. Biological sampling (2014-2023): SIOFA Observer database.
viii. Observer-reported catches (2014-2023): SIOFA Observer database.
ix. Observer coverage (2014-2023): SIOFA Observer database.

2.4 Analysis code

The code that produces all analyses presented in this report is publicly available at https://github.com/SIOFASecretariat/SIOFA_SC_Reports_code

3. Species Summary

Common name	oilfish and escolar
Scientific name	*Ruvettus pretiosus* and *Lepidocybium flavobrunneum*
Scientific synonyms	*Gempylidae* family
FAO species code	OIL and LEC
Year of this report	2025
Assessment Areas/ Management Units	Not defined
Assessment method	None
Most recent assessment	None
Year of next assessment	Not specified
Harvest strategy	Not defined
Summary of current stock status	Unknown

This report describes the oilfish and escolar fisheries in the SIOFA Area and available biological parameters for oilfish and escolar. For the purposes of this summary, 'oilfish' will be utilised to refer to both oilfish (OIL, *Ruvettus pretiosus*) and escolar (LEC, *Lepidocybium flavobrunneum*), unless otherwise specified.

Management advice for this species is given in the Report of the Scientific Committee of SIOFA and management decisions are summarised in the Report of the Meeting of Parties of SIOFA. No management advice has been agreed for oilfish in the SIOFA area.

The SIOFA Scientific Committee has provided interim advice, endorsed by the SIOFA MoP, to put in place an interim catch limit for oilfish corresponding to the average annual catch in the last 5 years (see paragraph 79, MoP10 Report). However, no further management advice has been agreed for oilfish in the SIOFA area.

A harvest strategy for the oilfish stocks in the SIOFA area has not yet been developed.

No stock assessment is available for oilfish stocks in the SIOFA area.

4. Biological Summary

Oilfish *(Ruvettus pretiosus*) is a fish with a cosmopolitan distribution in subtropical and temperate oceans. Oilfish are found at depths of 100-800 m but more commonly 200-400 m. Escolar (*Lepidocybium flavobrunneum)*, another fish in the same family (*Gempylidae*)*,* are found at similar depths (200–885 metres) in tropical to temperate waters around the world (Froese and Pauly 2022).

Oilfish and escolar can grow in excess of 2 m and over 50 kg, though most do not exceed 150 cm and 30 kg. The maximum recorded weight is 63.5 kg. Not much is known about their reproductive biology, but they are thought to undertake long seasonal migrations between feeding and spawning areas. They feed on benthopelagic fish, crustaceans, and squid (Vasilakopoulos *et al.* 2020), but they have a wide vertical range in the water column, catching prey items at the surface or in shallow waters, as well as epi-mesopelagic fish, in addition to mesopelagic cephalopods (Viana *et al.* 2012).

Both species have very high levels of indigestible wax esters in their flesh (Aldsworth 2017), which has led to a ban on sales in some countries like Japan or Italy; nonetheless these species are sought after in several countries and are caught in substantial amounts in the SIOFA area.

5. Description of the fishery

5.1 Fleet and gear

Oilfish are targeted in the SIOFA Area using pelagic longlines. Target fisheries are confined to the western edge of the SIOFA area near the African continental shelf, but oilfish are also caught incidentally at lower levels in pelagic longline fisheries targeting tuna throughout the SIOFA area (Figure 1). The only CCP that participates in the target oilfish fishery is Chinese Taipei., but a very small amount of catch is also reported by other CCPs from midwater trawls and gillnets.

In the 2019-2023 period, participation in the oilfish fishery has involved on average 37.8 vessels per year.

5.2 Fishing areas

Catch of oilfish have been reported in pelagic longline fisheries, targeting either oilfish or tuna or without a particular target, all across the SIOFA area (Figure 2). The highest catches of oilfish have been recorded from the western edge of the SIOFA area, near the African continental shelf, primarily in SIOFA subarea 1 and 3b.

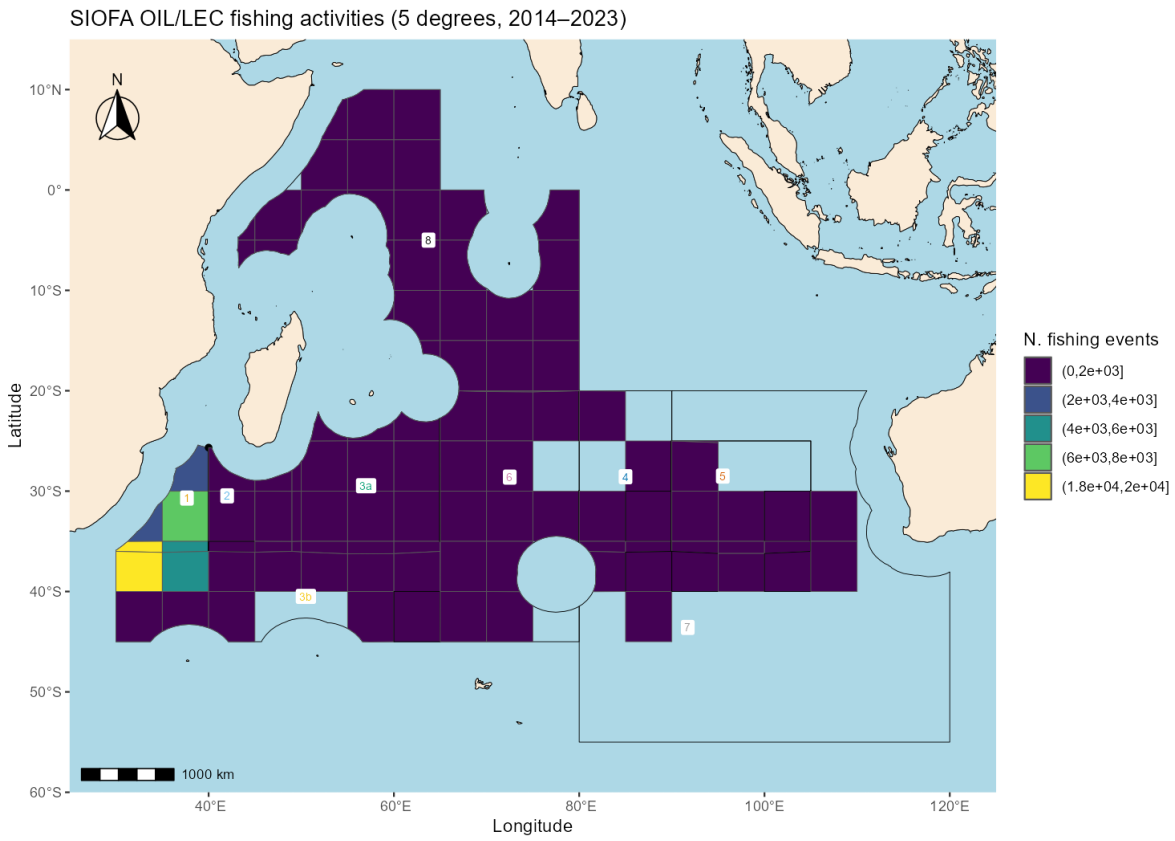


Figure 2 – Spatial distribution of fishing events that caught oilfish in the SIOFA Area, derived from haul-by-haul level fishing data, aggregated at a 5x5 degrees resolution (source: SIOFA HBHCatchEffort databases 2014–2023). This map represents all fishing events that caught any OIL or LEC, irrespective of declared target species.

5.3 Assessment Areas

No stock assessment areas have been defined for oilfish.

5.4 Catch and effort

Note that fishing effort and catches reported in this section are intended to represent total catch of OIL and LEC, irrespective of whether each particular fishing event had been targeting these two species or not. Consequently, CPUE represents the CPUE of all operations that caught oilfish even as bycatch (e.g., in fisheries targeting tuna (TUN)), so if the share of operations actively targeting oilfish increases, then CPUE is likely to increase as well. In this context CPUE as depicted here cannot be considered a reliable index of abundance.

Catches of oilfish in the SIOFA area were first reported in 2013, but at very low levels (Figure 3a). The average annual catch of oilfish (both oilfish and escolar combined) during the recent (2018–2022) period was 13529.6 t.

Oilfish is also caught in IOTC, but the data on these catches are not included in this Summary. IOTC catches are reported to the SIOFA Scientific Committee annually, in a separate report.

Effort and catches are represented in Figure 3a. Note that the effort figures in Figure 3a include also fishing events that targeted species other than oilfish, so long as that fishing event also caught oilfish, but exclude all effort for which the oilfish catch was zero. For this reason, the unstandardised CPUE shown in Figure 3 cannot be considered an index of abundance.

Oilfish is mostly caught in the western edge of the SIOFA area, near the African continental shelf (i.e., mainly subareas 1 and 3b; see Figure 3b). The SIOFA SC8 and MoP10 noted the significant catch of oilfish in cells that are both in exclusive economic zones (EEZs) and in the SIOFA area and stressed the need to consider this catch information for any future assessment of oilfish in the SIOFA Area.

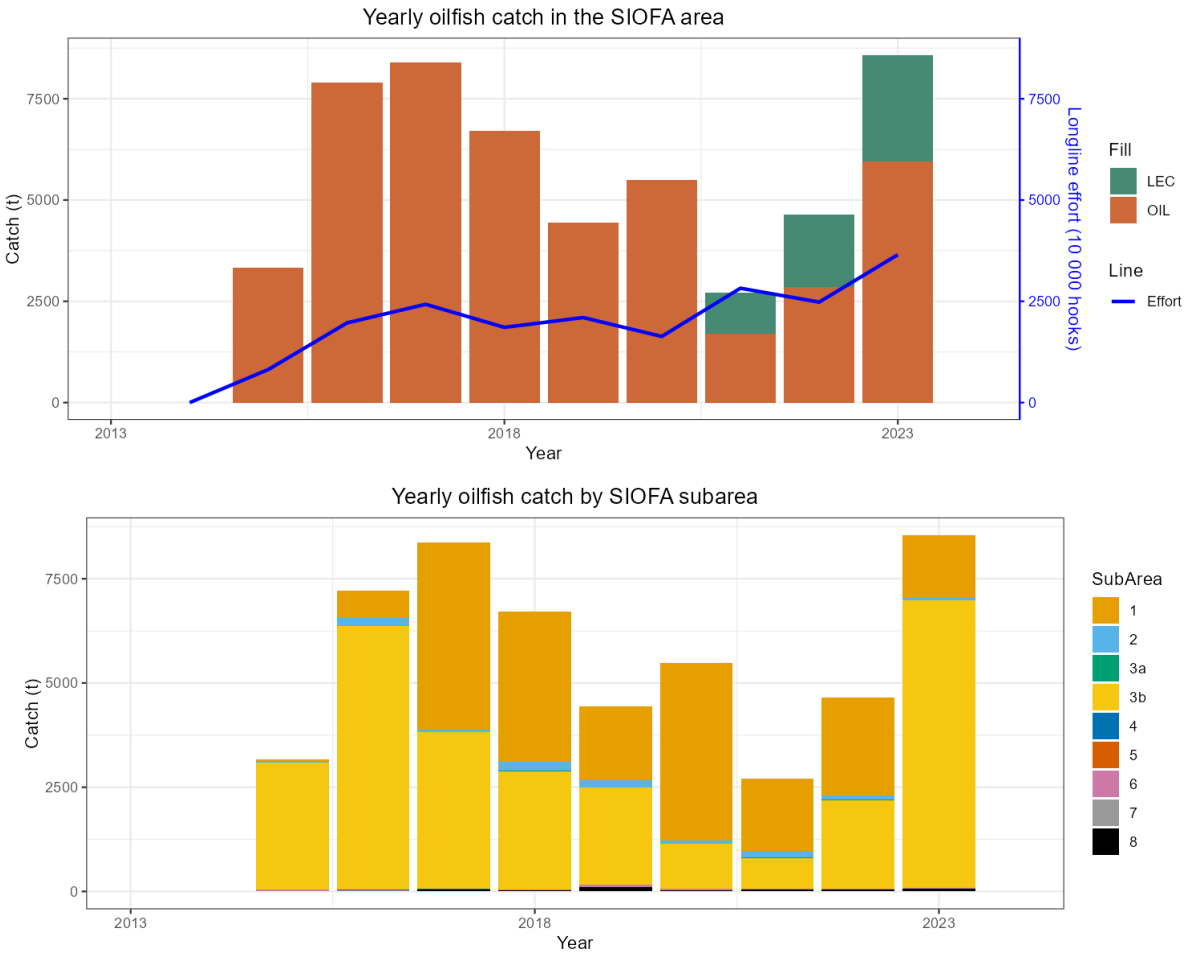


Figure 3a and b — Yearly catch of oilfish (t) and effort (10 thousand hooks) in the SIOFA area (upper panel, a) and in different SIOFA subareas (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023).

Effort has been relatively stable in recent years, with slightly declining catches (Figure 3), such that unstandardised catches per units of effort (CPUE) are slightly declining (Figure 4).

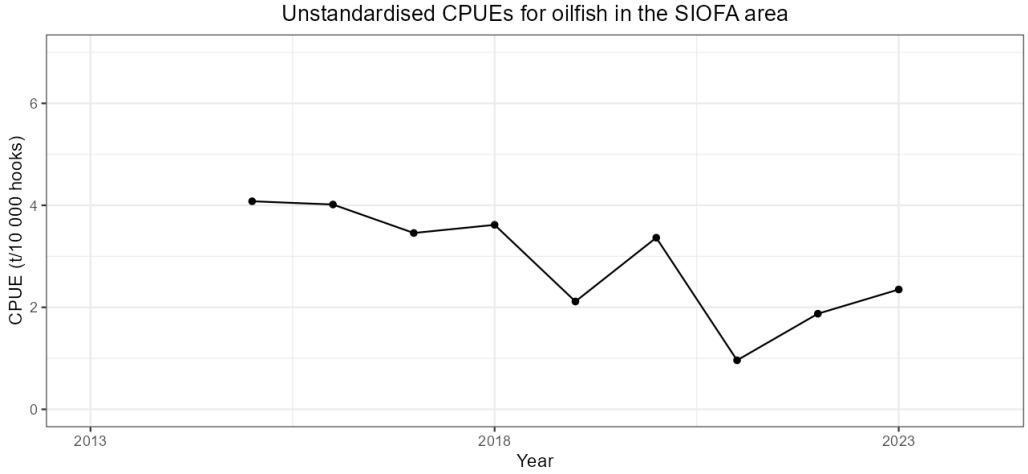


*Figure 4 – Unstandardised catch per unit effort (CPUE) of oilfish in the SIOFA area (t/*10 thousand hooks*) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023).*

The SC8 reviewed the annual catch, nominal CPUE and length frequency distributions of oilfish from the national report of Chinese Taipei and concluded that there was no obvious sign of negative impact from Chinese Taipei pelagic longline fishery on the oilfish stock in SIOFA area. The significant catch decline of 2021 was due to the sharp shrinkage in market demand so that those pelagic longline fishing vessels switched to target tuna species.

The SC8 recommended that the length distribution and the standardised CPUE should be used as oilfish stock indices in the short term, to monitor the oilfish stock in SIOFA area.

The SC8 recommended that Chinese Taipei provide working papers on analyses of the length fluctuation and the standardised CPUE of oilfish to the SC to review the pelagic longline fishery fishing impact on the oilfish stock.

In 2025, folowing the recommendation of SC8, Chinese Taipei provided the working paper SC-10-75 related the development of CPUE standardization with the oilfish longline fishing data from 2017 to 2023. Details of the preliminary results are shown in Section 8.3, and for understanding the implications for the CPUE index, Chinese Taipei is willing to provide the CPUE standardization analyses of the oilfish and escolar with updating data in the Indian Ocean.

For the length fluctuation parts of the oilfish and escolar, the information of these two species were included in the Section 4 of the Chinese Taipei annual national report 2025. Also, the updated information will be included in the same section of the national report continually.

In the following figures ‘target catch’ has been defined as the catch of oilfish and escolar that were caught in any fishing operation declaring OIL/LEC targets. All other species captured in OIL/LEC targeted fishing operations have been considered as bycatch. Note that oilfish catches were first recorded in 2013 (see Figure 3), but oilfish was only recorded as a target species in the SIOFA area beginning in 2017, so these data are limited to the most recent years.

Low levels of incidental catch of oilfish have been reported in longline fisheries across the SIOFA area (Figure 2) but oilfish target fisheries are confined to the western edge of the SIOFA near the African continent, primarily in subarea 1 and to a lesser extent in subarea 3b (Figure 3).

Oilfish catch and bycatch are further investigated in Section 10.

5.5 Catch limits

There are currently no catch limits for oilfish in the SIOFA area.

5.6 Illegal Unreported and Unregulated (IUU) catch

No claims of Illegal Unreported and Unregulated (IUU) catches of oilfish have been reported to SIOFA.

5.7 Other sources of fishing mortality

Some unaccounted mortality may be expected to occur arising from whale depredation, whereby killer whales and/or sperm whales are known to remove fish from longlines during hauling (Gasco *et al.* 2021). Whale depredation is mostly associated with toothfish fisheries; the extent to which whale depredation also affects longline fisheries targeting or catching oilfish is unknown.

6. Stock assessment and status

No stock assessment has been completed for oilfish in the SIOFA area.

6.1 Harvest strategy and reference points

Harvest strategies for oilfish have not been decided upon within SIOFA.

The SIOFA Scientific Committee has provided interim advice, endorsed by the SIOFA MoP, to put in place Harvest Control Rules for interim management, notably to maintain catches at present levels (unless there is evidence of a marked downward trend in the resource) until sufficient further informative data becomes available for meaningful improvements to the existing assessments. Where not previously defined for specific stocks, the SC recommended the present level be defined as the average (mean) of the 5 year period 2018–2022 for oilfish (see paragraph 79, MoP10 Report). However, no further management advice has been agreed for oilfish in the SIOFA area.

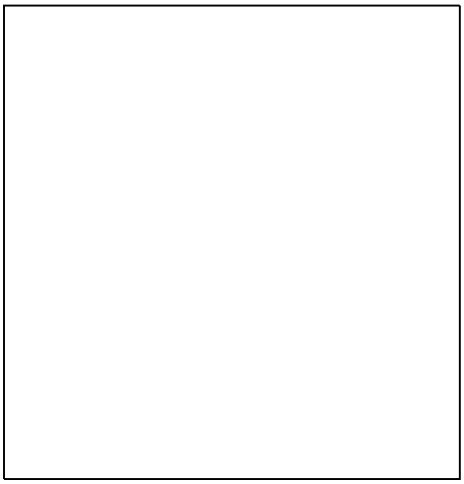
For a range of species, Butterworth *et al.* (2021) discusses the relative merits and drawbacks of adopting a harvest strategy based on either i) a constant catch consistent with recent 'status quo' catch levels; or ii) a simple harvest strategy based on an estimate of B_{msy} and thus F_{msy}, or iii) a constant fisheries mortality (F) consistent with recent 'status quo' F values.

Specifically for oilfish, Butterworth *et al.* (2021) noted that this is a data poor species in the SIOFA area, such that only the first approach is viable at this time (i.e. setting a TAC based on recent average catch levels) until more data are available, augmented by one or more precautionary provisions (e.g. applying the SAFE methodology; see Zhou *et al.* 2016).

7. Data collection

Catch and effort fishery data are collected under CMM 02(2023) and were submitted by the CCPs listed in Table 1.

Table 1 – Oilfish catch and effort data submitted by different SIOFA CCPs, by year (source: SIOFA AggregatedCatchEffort and HBHCatchEffort database 2014–2023). HBH= haul-by-haul level data; AGG= aggregated data at different levels.



Scientific Observer biological data (i.e., measures and biological samples of orange roughy) are collected as a requirement of CMM 02(2023), and were submitted by the CCPs listed in Table 2.

Table 2 – Oilfish Scientific Observer biological data collected by different SIOFA CCPs, by year (source: SIOFA Observer database 2003–2022).

Oilfish observer data submitted by different SIOFA CCPs	
Year	**Country**
2007	AUS
2012	AUS
2015	AUS
2016	AUS
2019	ESP
2020	ESP
2021	TPE
2022	ESP
2022	TPE
2023	CHN
2023	TPE

7.1 Biological data summaries

A summary of oilfish and escolar biological data collected by Scientific Observers, and counts of records by year for selected data fields, are shown in Table 3 and Table 4, respectively.

Table 3 – Oilfish biological data collection by Scientific Observers, by year. Numbers of records per year are summarised for the following: length, weight, otoliths collected, sex determination, and gonad maturity stage, gonad weight, and stomachs sampled (source: SIOFA Observer database 2014–2022).

Oilfish observer data measurements							
Year	**Length (n)**	**Weight (n)**	**Otoliths collected (n)**	**Sex (n)**	**Maturity (n)**	**Gonad weight (n)**	**Stomachs sampled (n)**
2015	14	13	14	14	7	0	14
2016	10	5	10	10	10	0	10
2019	3	3	0	0	0	0	0
2020	4	4	0	0	0	0	0
2021	8 240	8 240	0	8 240	0	0	0
2022	16 675	10 510	8	16 922	0	0	0
2023	2 678	2 417	0	2 682	0	0	0
Total	27 624	21 192	32	27 868	17	0	24

Table 4 – Escolar biological data collection by Scientific Observers, by year. Numbers of records per year are summarised for the following: length, weight, otoliths collected, sex determination, and gonad maturity stage, gonad weight, and stomachs sampled (source: SIOFA Observer database 2014–2022).

Escolar observer data measurements							
Year	**Length (n)**	**Weight (n)**	**Otoliths collected (n)**	**Sex (n)**	**Maturity (n)**	**Gonad weight (n)**	**Stomachs sampled (n)**
2019	1	1	0	0	0	0	0
2021	4 159	4 159	0	4 159	0	0	0
2022	7 041	4 328	0	7 078	0	0	0
2023	1 496	1 309	0	1 488	0	0	0
Total	12 697	9 797	0	12 725	0	0	0

7.2 Tag data

SIOFA does not require or conduct any tagging of oilfish.

8. Summaries of abundance indices and other observational data

8.1 Scaled length frequencies

Scaled length frequency data are not available for oilfish.

8.2 Scaled age frequencies

Scaled age frequency data are not available for oilfish.

8.3 CPUE indices

Effort has been relatively stable in recent years, with slightly declining catches (Figure 3), such that unstandardised catches per units of effort (CPUE) are slightly declining (Figure 4). In 2021 effort increased and catches decreased, leading to a marked decline of unstandardised CPUE.

Unstandardised CPUE cannot be considered a reliable index of abundance.

At SC10, Chinese Taipei provided working paper SC-10-75 related the preliminary development of standardized CPUE based on the oilfish longliner fisheries data from 2017 to 2023. As the preliminary results CPUE standardizations of these two species (OIL/LEC), the CPUE trend of OIL and LEC were both increasing with updated data in 2023 (Figure 5). The pattern of the CPUE trends in both species were revealed relatively stable status in recently years. Further work would have to address the temporal duration of data series of these two species in the Indian Ocean in order to understand the implications for the CPUE index.

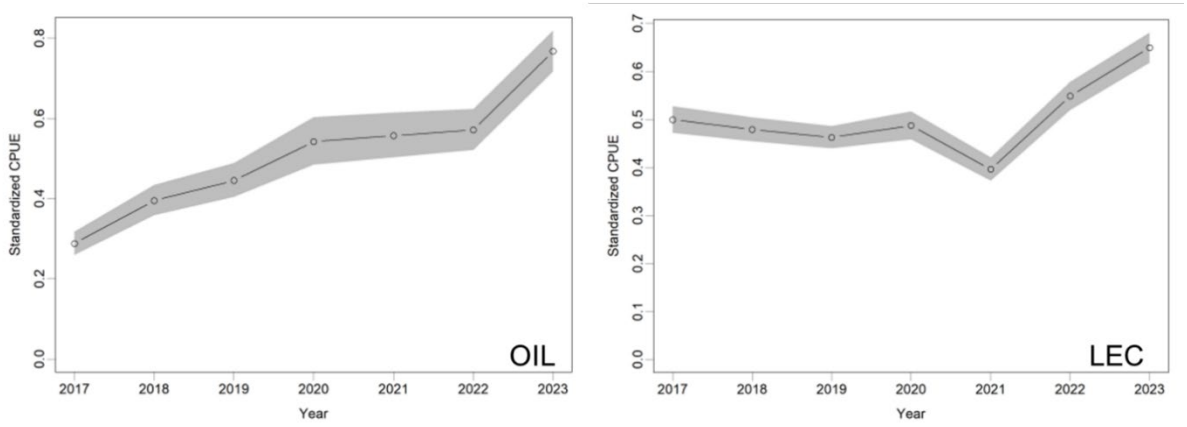


Figure 5 - Standardized CPUE index of oilifsh and escolar in oilfish fishery. Shaded areas illustrate the 95% confidence intervals. Source: paper SC-10-75 (restricted paper)

8.4 Acoustic biomass indices

It is considered infeasible to utilise acoustic survey methods to assess oilfish in the SIOFA area.

8.5 Trawl survey indices

No trawl surveys have been undertaken for oilfish in the SIOFA Area.

8.6 Tag based abundance estimates

SIOFA does not require or conduct tagging of oilfish and no oilfish tagging experiments in the SIOFA Area have been reported to SIOFA.

9. Biological parameters

Biological parameters have not been estimated for oilfish from data collected specifically from SIOFA fisheries. Globally, very little is known about their growth and reproductive biology (Vasilakopoulos *et al.* 2011).

Butterworth *et al.* (2021) propose = 0.11, L_∞ = 90 cm, and maximum age = 42, but note that the maximum size is not consistent with lengths exceeding 2 m from individuals sampled elsewhere (Table 4).

Table 5 – Available biological parameters for oilfish (oilfish (Ruvettus pretiosus) and escolar (Lepidocybium flavobrunneum)).

Relationship	Parameter (units)	Area	Value			References
			Both	Male	Female	
Natural mortality	M (y^{-1})	all	0.11			Butterworth *et al.* (2021)
Von Bertalanffy growth coefficient	t_0 (y)					
	k (y^{-1})					
	L_∞ (cm)		90			Butterworth *et al.* (2021)
	c.v.					
Length-weight (OIL) Rw = a FL^b	a ($kg.cm^{-1}$)	IO	1E-06	2E-06	2E-06	SC-10-76 (2025)
	b	IO	3.3391	3.2480	3.2457	SC-10-76 (2025)
Length-weight (LEC) Rw = a FL^b	a ($kg.cm^{-1}$)	IO	3E-06	1E-06	6E-06	SC-10-76 (2025)
	b	IO	3.2715	3.4369	3.1173	SC-10-76 (2025)
Maturity	a_{50} ($\pm a_{to95}$)					
Stock recruitment relationship						
Stock recruitment steepness	h					
Recruitment variability	σ_R					
Ageing error type	Normal					
Ageing error parameters	c.v.					

9.1 Natural mortality

Natural mortality has not been estimated specifically for oilfish in the SIOFA Area.

Butterworth *et al.* (2021) proposed a value of M = .11 for oilfish in the SIOFA area.

9.2 Growth parameters

Growth parameters have not been estimated specifically for oilfish in the SIOFA Area.

Butterworth *et al.* (2021) proposed the following biological growth parameters for oilfish (Table 5) but note that the L-inf value is not consistent with much larger individuals sampled elsewhere.

Table 6 – Growth parameters for oilfish in the SIOFA Area proposed by Butterworth et al. (2021).

Parameter	Combined sex
L-inf	90 cm
kappa	0.2
Average age at maturity	?
Maximum age	42

9.3 Length/age relationship

No length-age relationship is available for oilfish sampled specifically in the SIOFA area.

Von Bertalanffy growth parameters for based on review of oilfish parameters derived elsewhere are shown above in Tables 1 and 2 (from Butterworth *et al.* 2021).

9.4 Maturity and spawning

No maturity analysis is available derived from oilfish sampled specifically in the SIOFA area.

9.5 Stock recruitment relationship

The stock-recruitment relationship for oilfish has not yet been investigated in the SIOFA area.

9.6 Tag parameters

SIOFA does not require or conduct any tagging for oilfish.

10. Catch/bycatch and ecosystem impacts

Bycatch commonly refers to the capture of all fish species that were not intended as a target in a given fishing event.

Bycatch was defined by the SIOFA SC as "*Fishery resources that are not target nor targeted typically in the taxonomic classes Chondrichthyes and Actinopterygii and infraphylum Agnatha and class Cephalopoda and Crustacea, that are part of the catch which is not the target*" (paragraph 207c of the SC8 report).

The ratio of catch and bycatch in the oilfish fisheries suffers from a lack of reported target species for fishing events that caught oilfish prior to 2021.

Hence, it was not possible to determine catch/bycatch ratios in these events based on declared targets. As a practical means of estimating the catch/bycatch ratio in fishing events where targets were not declared, the Workshop on the development of ecosystem and fisheries summaries (WS2022-SUM1) suggested using a catch threshold whereby hauls in which at least a certain percentage of the catch was oilfish, to be designated as oilfish target hauls. This section uses a 20% target catch threshold (a typical average threshold for declared events).

Note that this threshold only applies to undeclared target fishing events; fishing events targeting tuna (TUN) that also caught oilfish are thus excluded from the following analysis.

10.1 Oilfish catch/bycatch

Catch/bycatch is depicted in Figure 6. Note that the 20% catch threshold rule to define oilfish target hauls was applied only to fishing effort for which targets were not declared, and that the ratios might not be strictly comparable to the data where targets were declared in this figure. Future work should consider harmonizing this time series.

The main species reported as bycatch in SIOFA fisheries targeting OIL/LEC were pelagic fishes nei (PEL) and elasmobranchs nei (SKX), as shown in Figure 7.

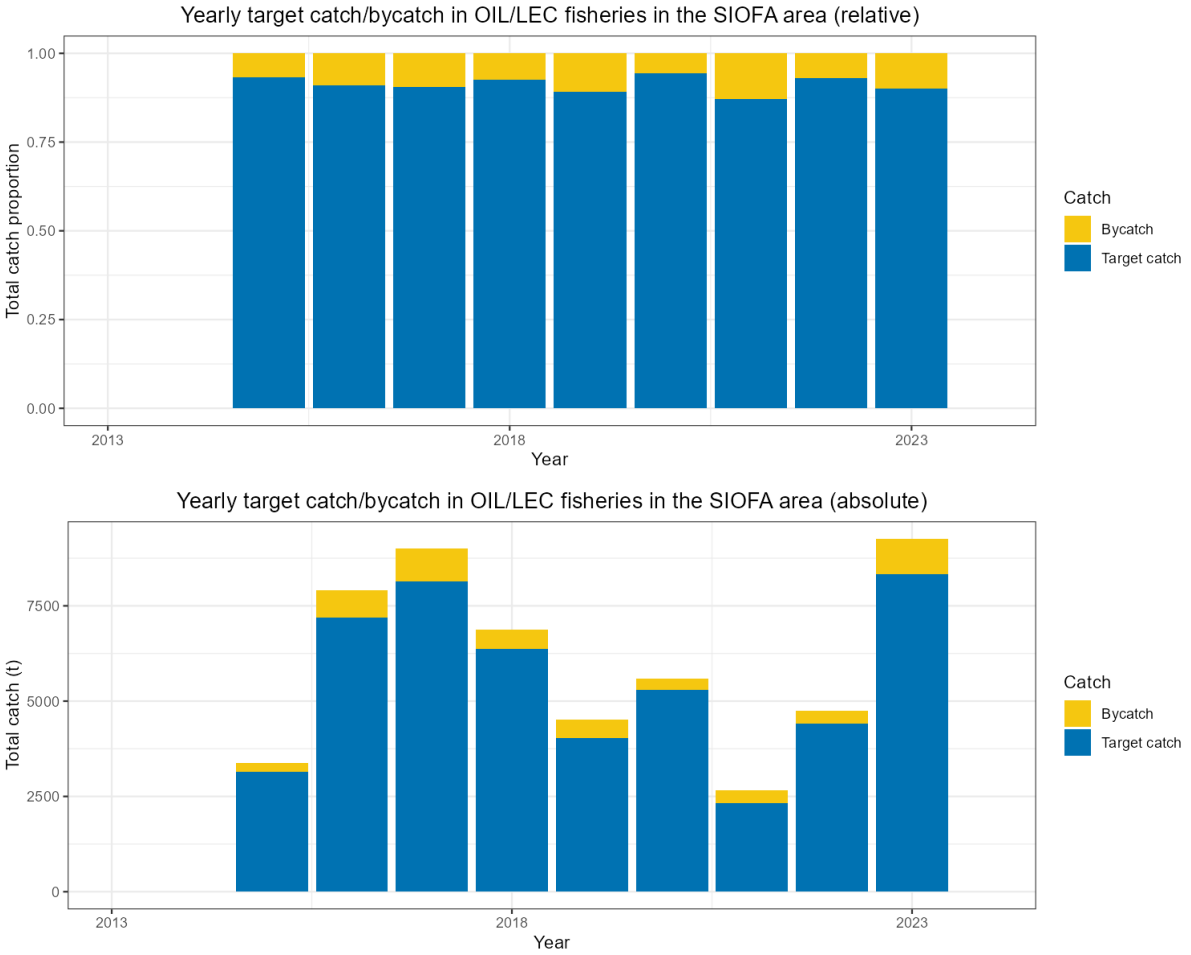


Figure 6a and b – Total catch of oilfish and other bycatch species in SIOFA fisheries that targeted oilfish, shown as relative values (upper panel, a) and absolute values (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023).

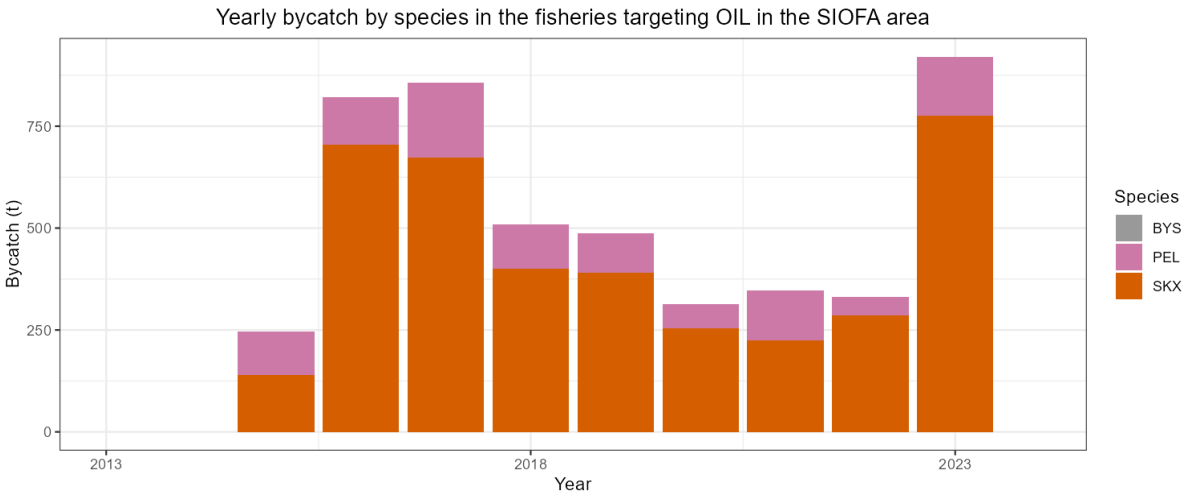


Figure 7 – Yearly catch of bycatch species in fisheries targeting oilfish in the SIOFA Area, by species (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Only the top 5 species by weight (cumulatively in the full database) are shown individually (identified by their 3-letter FAO code). All other species are grouped under 'other species.

Sharks is used in this report as a broad term to include all Chondrichthyans (see Appendix B of the Overview of SIOFA Fisheries for a full list of taxa), unless otherwise specified.

Catches of sharks in the oilfish fishery are very common, but poorly characterized. The most bycaught shark taxon by weight was only characterized as elasmobranchs nei (SKX) (Figure 8). Sharks constituted the majority of fish bycatch records.

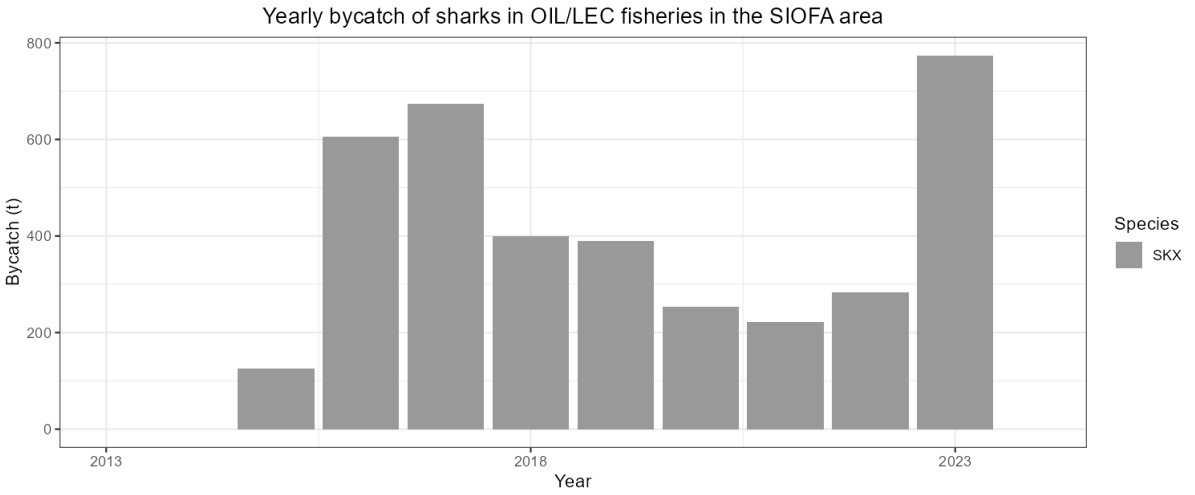


Figure 8 – Reported bycatch of shark species in fisheries targeting alfonsino (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023).

In 2024, Chinese Taipei voluntarily submitted a summary of the captures of sharks identified by Scientific Observers (Table 7).

Table 7 – Number of sharks captured in fishing operations that targeted oilfish (source: Chinese Taipei data 2019–2023, special submission).

Year	Common name	Scientific name	Fishing gear	Captures
2019	Blue shark	*Prionace glauca*	Longline nei	516
2019	Bigeye thresher	*Alopias superciliosus*	Longline nei	1
2019	Longfin mako	*Isurus paucus*	Longline nei	55
2019	Crocodile shark	*Pseudocarcharias kamoharai*	Longline nei	2
2019	Shortfin mako	*Isurus oxyrinchus*	Longline nei	13
2020	Thresher shark	*Alopias spp.*	Longline nei	1
2020	Blue shark	*Prionace glauca*	Longline nei	53
2020	Bigeye thresher	*Alopias superciliosus*	Longline nei	3
2020	Crocodile shark	*Pseudocarcharias kamoharai*	Longline nei	2
2020	Silky shark	*Carcharhinus falciformis*	Longline nei	2
2020	Oceanic whitetip shark	*Carcharhinus longimanus*	Longline nei	2
2021	Thresher shark	*Alopias spp.*	Longline nei	6
2021	Blue shark	*Prionace glauca*	Longline nei	110
2021	Longfin mako	*Isurus paucus*	Longline nei	1
2021	Crocodile shark	*Pseudocarcharias kamoharai*	Longline nei	6
2021	Shortfin mako	*Isurus oxyrinchus*	Longline nei	12
2022	Thresher shark	*Alopias spp.*	Longline nei	1
2022	Blue shark	*Prionace glauca*	Longline nei	484
2022	Crocodile shark	*Pseudocarcharias kamoharai*	Longline nei	10
2022	Sharks nei	*Elasmobranchii*	Longline nei	1
2022	Shortfin mako	*Isurus oxyrinchus*	Longline nei	23
2023	Blue shark	*Prionace glauca*	Longline nei	212
2023	Shortfin mako	*Isurus oxyrinchus*	Longline nei	1
2023	Porbeagle shark	*Lamna nasus*	Longline nei	22

10.2 Catch/bycatch by SIOFA Subarea

Catches and bycatches in fisheries targeting oilfish in the SIOFA Area were largely concentrated in Subareas 1 and 3b, but some target catches also came from Subarea 2 (Figure 9).

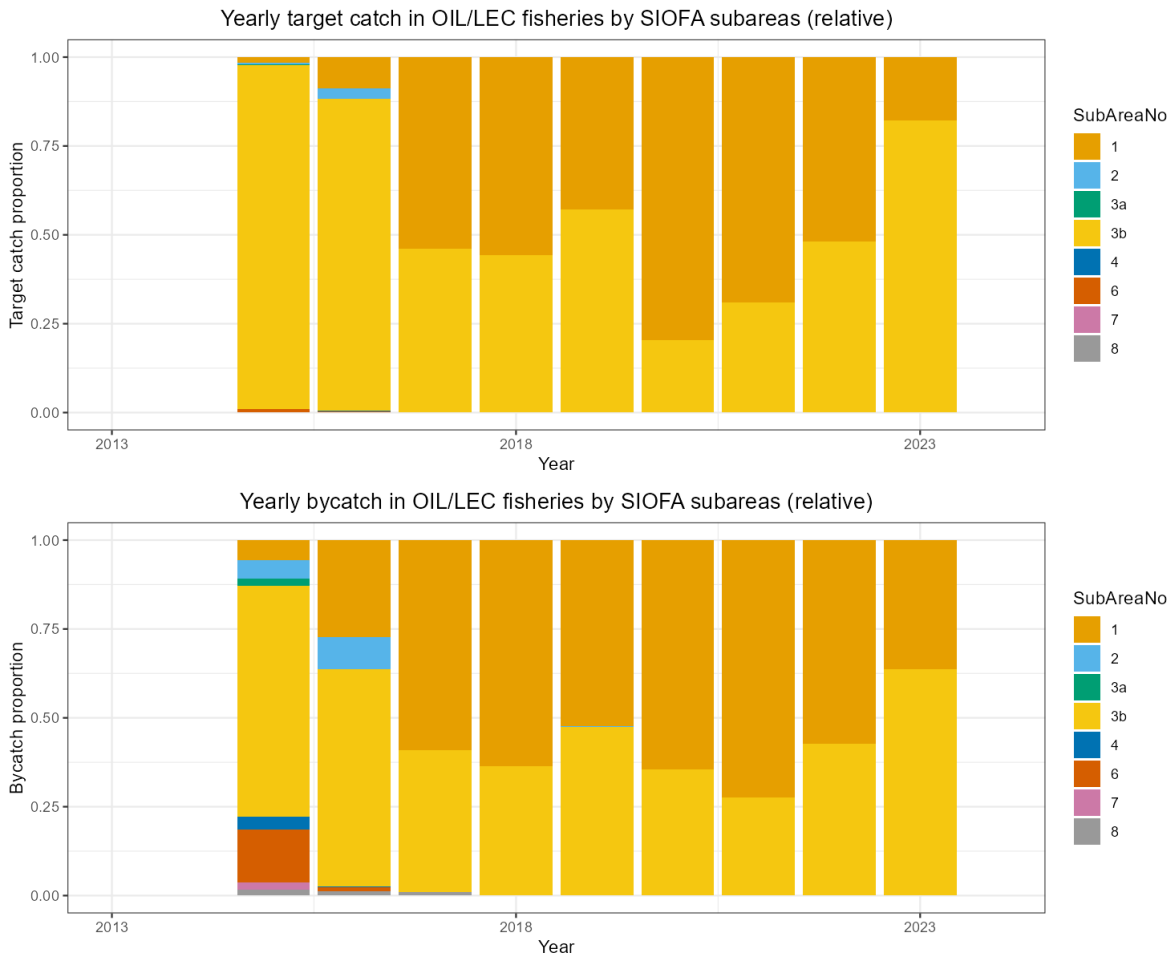


Figure 9a and b – Distribution of target catch (a) and bycatch (b) in fisheries targeting oilfish in different SIOFA Subareas (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Catches reported without location information are not included.

10.3 Discards

A specific field is included in SIOFA CatchEffort databases to indicate the fate of the catch, including retained, discarded and "other" categories.

Discard rates of fisheries targeting oilfish in the SIOFA Area are presented in Figure 10, but are not visible as they are a very small proportion of the total catches.

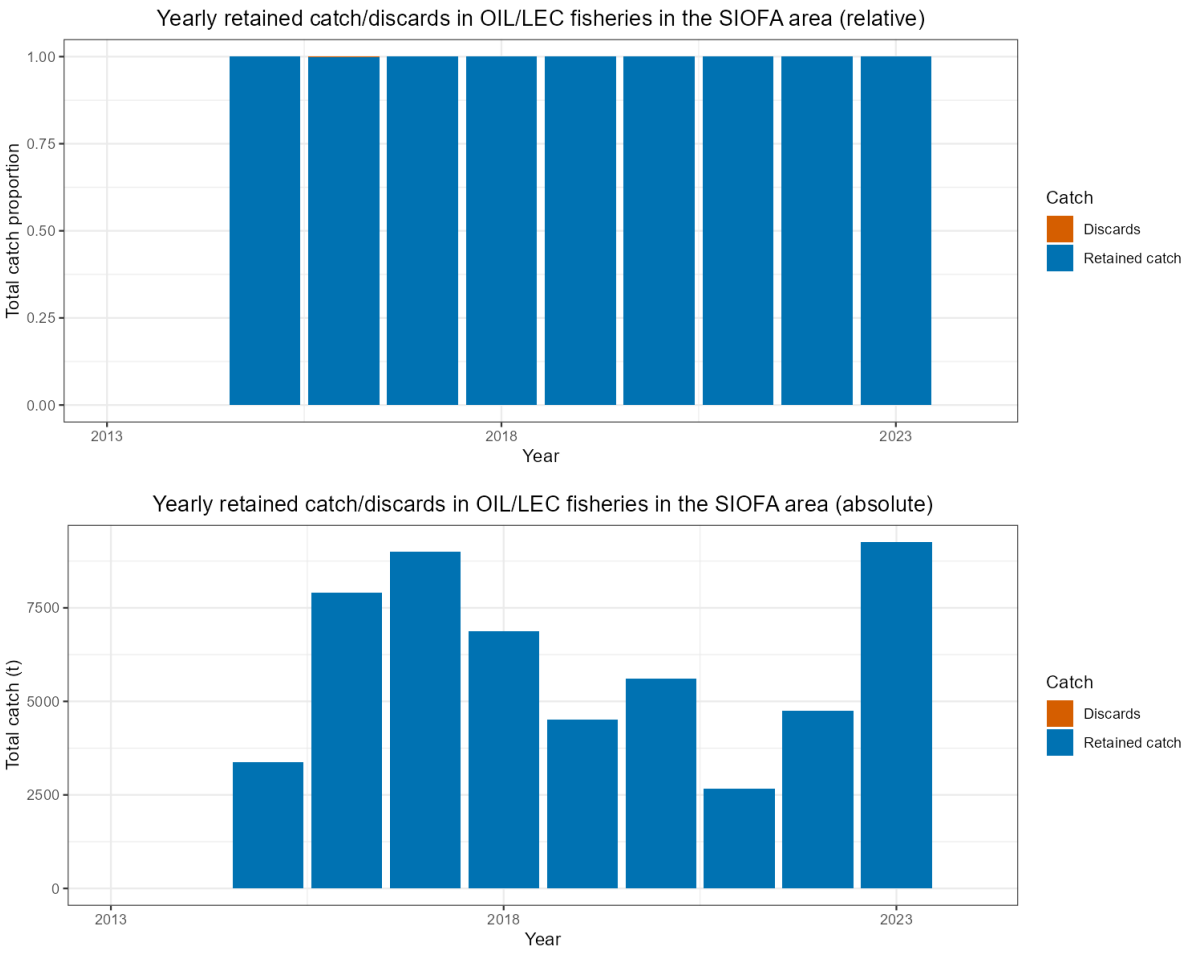


Figure 10a and b – Total retained and discarded catch in SIOFA fisheries that targeted oilfish, shown as relative values (upper panel, a) and absolute values (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Catches reported without location information are not included.

Discards composition by species in fisheries targeting oilfish in the SIOFA Area is presented in Figure 11. Some of the most represented species in discards are oilfish itself and elasmobranchs nei (SKX), and no discards were reported after 2019.

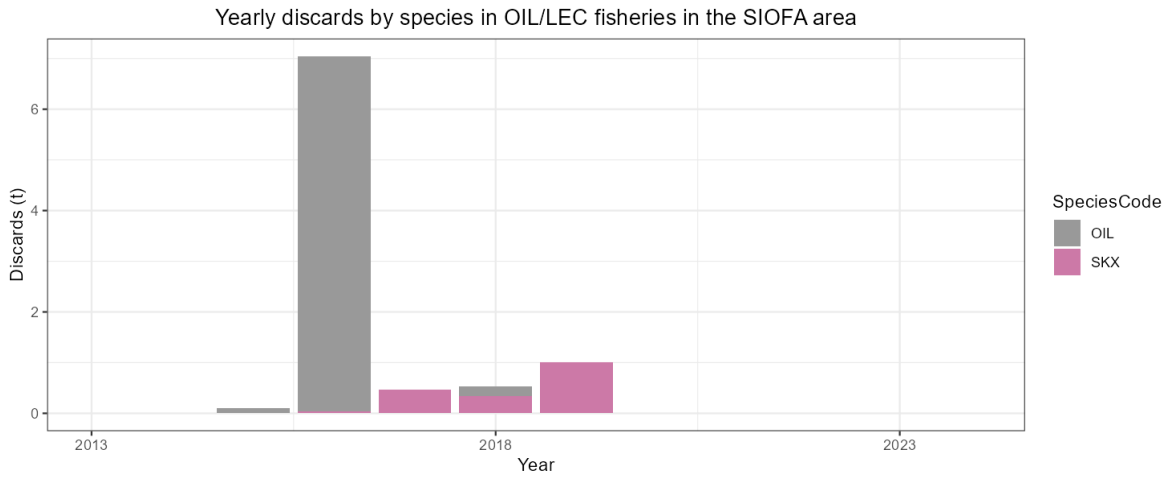


Figure 11 – Reported discards of fish species in fisheries targeting oilfish (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023).

10.4 Target catch/bycatch in management units

No management units or stock assessment areas have been defined for oilfish.

10.5 Incidental catch of VME taxa and other invertebrates

Oilfish are targeted using pelagic (drifting) longlines, and occasionally caught as bycatch using other methods (gillnets and midwater trawls), therefore no VME incidental capture data has been reported for this fishery and is unlikely to be reported in the future.

11. Interactions with seabirds, mammals, turtles, sharks and other species of concern

Only incidental captures of seabirds, marine mammals, turtles, and sharks considered to be at high risk and/or concern are reported in the SIOFA Scientific Observer database, and the following sections have drawn from this database to explore the number and locations of these interactions.

Incidental captures of other species (e.g., of sharks) are also recorded in the SIOFA CatchEffort database but are not reported here (see Section 10.1 instead).

While recent years (2021-2022) had a full (100%) Scientific Observer coverage of drifting longlines in SIOFA (see SIOFA Ecosystem Summary), coverage in earlier years is hard to estimate from available data.

Figure 12 shows the reported locations of incidental captures (Figure 12a) and observations (Figure 12b) of seabirds, mammals, and sharks considered to be at high risk and/or concern (i.e., included in SIOFA CMM 12) captured in fishing operations targeting oilfish in the SIOFA Area, as recorded by Scientific Observers.

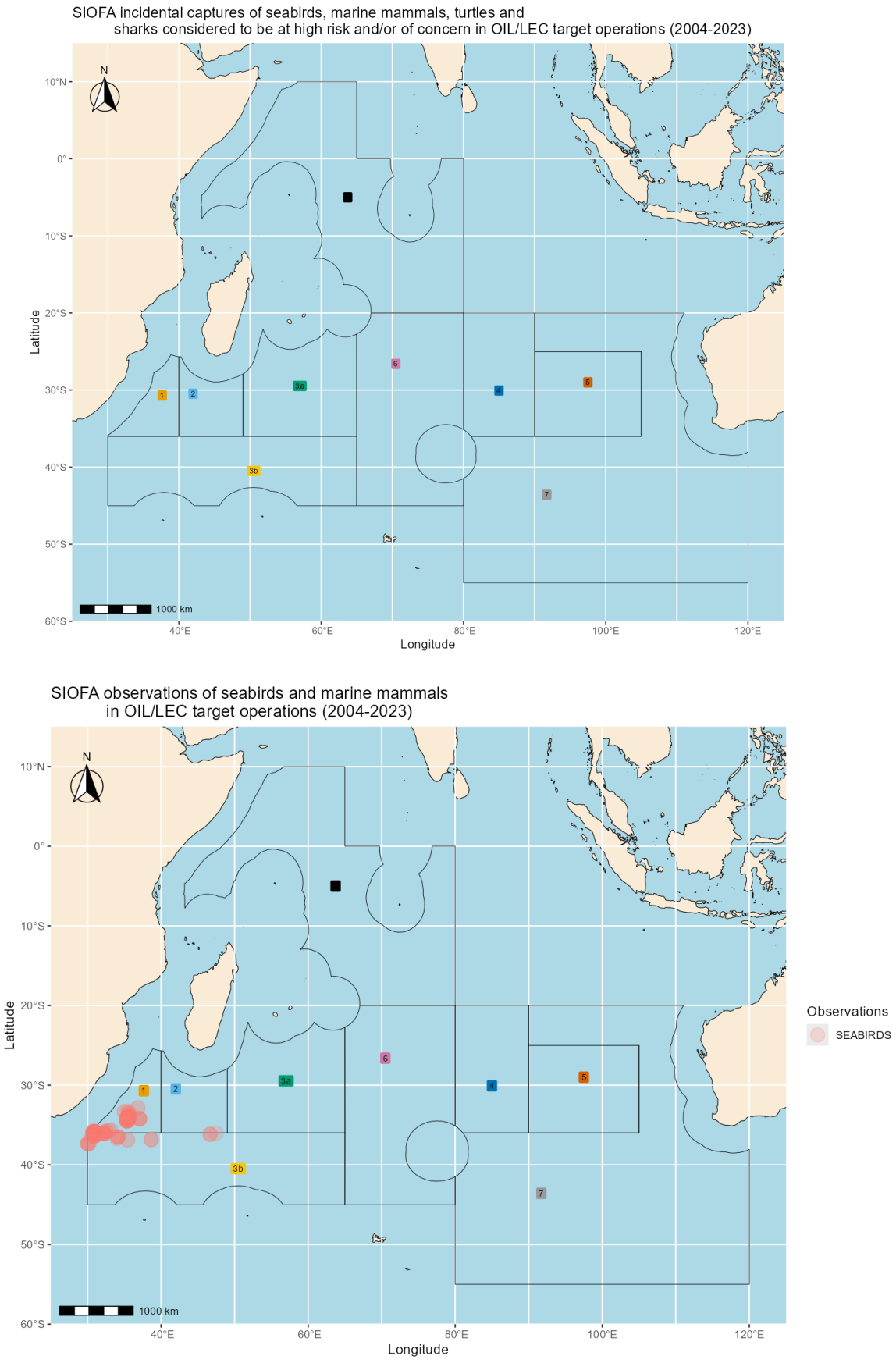


Figure 12a and b – Reported locations of incidental captures (a, upper) and observations (b, lower) of seabirds, cetaceans, and sharks considered to be "at high risk" and/or "of concern", as defined in Annex 1 of CMM 12(2024), captured in fishing operations targeting oilfish in the SIOFA Area, as recorded by SIOFA Scientific Observers (source: SIOFA Observer database 2012–2022). Note that no captures were recorded.

11.1 Seabirds

Provisions for the mitigation of accidental capture of seabirds in CMM 13(2022) (Conservation and Management Measure on mitigation of seabird's bycatch in demersal longlines and other demersal fishing gears fisheries (Mitigation of Seabirds Bycatch)) do not apply oilfish fisheries as they are not demersal fisheries.

11.1.1 Captures

No captures of seabirds have been reported in the Observer database for oilfish fisheries at this time. However, in 2024 Chinese Taipei voluntarily submitted additional data on seabirds captures in its own oilfish fishery, which is summarized in Table 8.

Table 8 – Number of seabirds captured in fishing operations that targeted oilfish (source: Chinese Taipei data 2019–2023, special submission).

Year	Common name	Scientific name	Fishing gear	Captures
2019	Wandering albatross	*Diomedea exulans*	Longline nei	1
2019	Grey petrel	*Procellaria cinerea*	Longline nei	1
2019	White-chinned petrel	*Procellaria aequinoctialis*	Longline nei	4
2019	Petrels and shearwaters nei		Longline nei	9
2019	White-capped albatross	*Thalassarche steadi*	Longline nei	3
2020	White-chinned petrel	*Procellaria aequinoctialis*	Longline nei	1
2020	Black-browed albatross	*Thalassarche melanophris*	Longline nei	1
2020	Sooty albatross	*Phoebetria fusca*	Longline nei	1
2021	White-chinned petrel	*Procellaria aequinoctialis*	Longline nei	3
2021	Albatrosses nei		Longline nei	3
2021	Sooty albatross	*Phoebetria fusca*	Longline nei	5
2021	Indian yellow-nosed albatross	*Thalassarche carteri*	Longline nei	2
2022	Indian yellow-nosed albatross	*Thalassarche carteri*	Longline nei	1
2022	Black-browed albatross	*Thalassarche melanophris*	Longline nei	1
2022	Salvin's albatross	*Thalassarche salvini*	Longline nei	1
2023	White-chinned petrel	*Procellaria aequinoctialis*	Longline nei	16
2023	White-capped albatross	*Thalassarche steadi*	Longline nei	6
2023	Albatrosses nei		Longline nei	1
2023	Sooty albatross	*Phoebetria fusca*	Longline nei	1
2023	Northern giant petrel	*Macronectes halli*	Longline nei	1

11.1.2 Observations

The presence of several different seabirds was recorded by Scientific Observers around fishing operations that targeted oilfish in the SIOFA Area (Table 9). In 2023, no operations targeting OIL/LEC were recorded as observed for seabird presence in the Observer database.

Table 9 – Number of seabirds observed around fishing operations that targeted oilfish (source: SIOFA Observer database 2004–2023).

Observations of seabirds in OIL/LEC fisheries (2004-2023)				
Year	**Common name**	**Scientific name**	**Fishing gear**	**Abundance**
2021	Antarctic giant petrel	*Macronectes giganteus*	Drifting longlines	64
2021	Cape petrel	*Daption capense*	Drifting longlines	379
2021	Indian yellow-nosed albatross	*Thalassarche carteri*	Drifting longlines	75
2021	Light-mantled sooty albatross	*Phoebetria palpebrata*	Drifting longlines	8
2021	Sooty albatross	*Phoebetria fusca*	Drifting longlines	7
2021	Wandering albatross	*Diomedea exulans*	Drifting longlines	20
2021	White-chinned petrel	*Procellaria aequinoctialis*	Drifting longlines	130
2022	Antarctic giant petrel	*Macronectes giganteus*	Drifting longlines	5
2022	Black-browed albatross	*Thalassarche melanophris*	Drifting longlines	1
2022	Cape petrel	*Daption capense*	Drifting longlines	330
2022	Indian yellow-nosed albatross	*Thalassarche carteri*	Drifting longlines	216
2022	Salvin's albatross	*Thalassarche salvini*	Drifting longlines	130
2022	Wandering albatross	*Diomedea exulans*	Drifting longlines	66
2022	White-chinned petrel	*Procellaria aequinoctialis*	Drifting longlines	525

11.2 Marine mammals interactions

Some interaction may be expected to occur between oilfish fisheries and killer whales engaged in longline depredation. Whale depredation is mostly associated with toothfish fisheries (Gasco *et al.* 2021); the extent to which whale depredation also affects longline fisheries targeting or catching oilfish is unknown.

11.2.1 Captures

No captures of mammals have been reported in oilfish fisheries at this time.

11.2.2 Observations

No observations of mammals were reported in oilfish fisheries at this time.

11.3 Turtles

No turtle interactions have been reported in oilfish fisheries at this time.

11.4 Shark captures of species considered to be at high risk and/or of concern

No captures of deep-sea shark taxa considered to be at “high risk” and/or “of concern” , as listed in Annex 1 of SIOFA CMM 12(2024) (Conservation and Management Measure for Sharks (Sharks)) were reported in the SIOFA Observer database for oilfish fisheries at this time and they are unlikely to be reported in the future.

12. Effects of the fishery on the ecosystem

The effects of this fishery on the ecosystems have not yet been investigated.

13. References

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